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Science | Sciences
Maritimes Region
Canadian Science Advisory Secretariat
Science Response 2014/023

SCALLOP FISHERY AREA/TIME CLOSURE TO PROTECT COD SPAWNING AGGREGATIONS IN 5Z (GEORGES BANK)

Context

The requirement to account for all fishing mortality of Georges Bank Atlantic Cod (*Gadus morhua*) in Canada has led to efforts by the offshore scallop fishery to reduce cod bycatch. Along with active avoidance protocols adopted by the offshore scallop fleet, Fisheries and Oceans Canada (DFO) has implemented area/time closures from early February to the end of March since 2005 to reduce bycatch and minimize disturbance to spawning aggregations of cod by the offshore scallop fishery on Georges Bank. To assist resource managers in determining appropriate area closures for the offshore scallop fishery on Georges Bank during the cod spawning seasons, fisheries management asked the following question: "What does a review of eastern Georges Bank (unit areas 5Zj and m cod distribution, particularly at spawning time, reveal about the spatial trends of the species and its overlap with the offshore scallop fishery? Highlight areas of high 5Zjm cod distribution using the cells previously defined and used." This document provides information on the spatial distribution of cod abundance on eastern Georges Bank during the spawning period based upon the DFO February/March Georges Bank research vessel (RV) survey and its overlap with scallop catches the Canadian portion of on Georges Bank. In the previous year's analysis, it was evident that cod distribution had changed enough to warrant using only more recent data. Therefore, the most recent 10-year period (2004-2013) of cod distribution is used to examine the spatial trends during the spawning period.

This Science Response results from the Science Response Process of January 8, 2014, on the Review of Scallop Fishery Closure to Protect Cod Spawning Aggregations on Georges Bank in 2014. It is an annual update of information provided in the Maritimes Region Science Expert Opinions series for 2006, and in the CSAS Science Response report series for 2007 and 2010 onwards. Updates were provided for 2008 and 2009 but were not published.

Analysis and Response

The 2013 first quarter Canadian offshore scallop catches on Georges Bank correspond to approximately 12% (628 mt of meats) of the Total Allowable Catch (TAC) for the year, which is below the long term average percentage for the first quarter (17% since 1990). At the start of the 2013 fishery, there were three industry-managed juvenile scallop closure areas in place (outlined in red in Figures 1 and 2). The center box ("growout box") was opened to fishing on May 25, 2013.

The analysis used to provide this information has been updated with the 2013 cod abundance data on eastern Georges Bank obtained from the annual DFO RV survey as well as scallop catches from the Canadian offshore scallop fishery logbooks. Details on the methods for this analysis can be found in the Maritimes Region Science Expert Opinion 2006 (DFO, 2006). Information from the DFO RV survey for 5Zjm conducted during late February/early March was used to identify areas of high aggregations of adult (age 3+) cod. The distribution of age 3+ cod was plotted on a grid of 5-minute longitude by 3.33-minute latitude cells (approximately12.5 nautical miles^2 or 43 km^2 per cell). Cod abundance data were "standardized" by dividing the number of cod per tow by the mean number per tow for the strata representing 5Zjm for each year of the survey by. These standardized estimates were averaged in each cell over the 2004

to 2013 time period. This has the effect of diluting the influence of very large tows and reducing between-year variability. In the previous year's analysis, a comparison of the most recent 10-year spatial distribution to that for the whole time series (starting in 1996) showed that a change in distribution had occurred, indicating that the full time series did not reflect recent cod distribution patterns adequately (DFO, 2013).

The average high cod aggregation areas for the last decade (i.e., cells with greater than 3.5 standardized age 3+ cod per tow), numbered 1 to 15 in order of decreasing abundance (Figure 1), were compared to 2013 first quarter scallop catches in those areas (Table 1). Eleven of the 14 cells ranked in the 2013 analysis remained as ranked cells in this analysis although not in the same sequence. This year's ranked cells did not include the highest ranked cell from the 2013 analysis. The second highest cell in this year's analysis was not ranked in 2013. Additionally, cells currently ranked 10, 11, and 14 did not rank in the previous analysis. Four ranked cells (3, 4, 5, and 8) were part of the 2013 scallop fishery cod closure. The strongest aggregation of cod occurred in an area near the center of the bank; however, there were also noteworthy high density cells of 3+ cod on the southern part of the bank (cells ranked 1 and 2) and on the northern part of the bank (cells ranked 6 and 13).

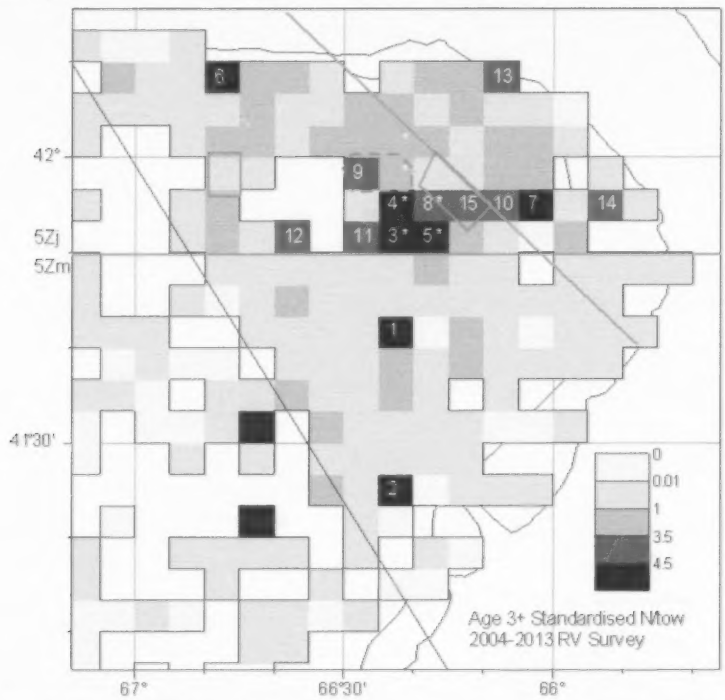

Figure 1. Distribution of aggregated age 3+ cod on eastern Georges Bank in late February/early March from DFO research survey data (2004 to 2013). The number per tow (N/tow) has been standardized by dividing the N/tow by the mean N/tow for the whole area, i.e. 5Zjm, for each year of the survey and then averaged in each cell from 2004 to 2013. Cells representing values greater than 3.5 standardized N/tow were ranked (highest to lowest, Canadian side only). Cells that were part of the 2013 scallop-fishery cod closure are indicated by an asterisk (*). The 2 current industry-initiated scallop-fishery closure areas and the "growout box" (opened May 25, 2013) are outlined in solid and dotted red lines, respectively. The horizontal red line demarcates NAFO divisions 5Zj and 5Zm. The diagonal red line demarcates the Georges Bank scallop management areas 'a' and 'b'.

Table 1. Association between Eastern Georges Bank first quarter scallop catch (mt of meats) by the Canadian offshore scallop fleet and cells of high cod density (cells with 3.5 or more standardized age 3+ cod on average in Feb/Mar RV survey data). The cod cells, numbered 1 to 15, are in descending order of cod abundance. Greyscale rankings indicate the abundance of scallop catch that corresponds to each cell of high cod density.

Year/Cod Cell No.	1	2	3*	4*	5*	6	7	8*	9	10	11	12	13	14	15
2013	0.0	0.0	0.0	0.0	0.0	2.6	0.0	0.0	4.2	1.1	0.0	0.0	0.0	0.0	0.4
2012	0.0	0.0	12.9	13.3	22.1	0.0	0.0	5.7	0.9	0.0	0.8	0.0	0.0	0.0	20.0
2011	0.0	0.0	7.9	5.8	25.9	0.7	0.0	8.1	6.6	0.0	0.6	0.0	0.0	0.0	0.0
2010	0.1	0.0	0.3	0.0	3.8	1.2	0.0	0.4	12.2	0.0	0.7	0.7	0.0	0.0	0.6
2009	0.4	0.0	0.3	4.2	1.4	1.8	0.0	2.3	31.6	0.0	0.4	0.6	0.0	0.9	8.5
2008	0.0	0.0	0.0	0.0	37.3	6.1	0.0	94.3	34.6	0.0	0.0	0.0	0.0	0.0	109.6
2007	0.0	0.0	0.8	0.5	0.8	0.4	0.0	0.0	172.1	0.0	0.0	0.0	0.0	0.0	1.8
2006	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
2005	1.1	0.0	0.0	0.5	2.4	0.0	5.4	2.1	0.0	8.6	2.7	0.6	0.0	0.0	0.2
2004	0.0	0.0	0.4	1.9	10.8	1.4	0.0	12.9	4.8	0.0	1.0	0.5	0.0	0.0	0.4

** indicates cells that were part of the 2013 closure (Note: closure included 2 cells that are not represented here)*

Legend: Scallop Catch
Colour: Scallop Catch (mt of meats)

50 = Catch ≥ 50
25 = catch < 50
10 = catch < 25
5 = catch < 10
0 < catch < 5
Catch = 0

The 2013 first quarter (Q1) scallop landings in the 10 highest ranked standardized cells were 7.88 mt (only 1.3% of the Q1 scallop landings of 628 mt). The cells selected for closure in February and March of 2013 (see asterisks in Figures 1 and 2; 4 of which are ranked in this analysis) had a total of 4.11 mt first quarter scallop landings prior to the closure, which began on February 4, 2013. A closure based on the top ranking cells would have a relatively low impact on the offshore scallop fishery if the 2014 first quarter scallop fishing distribution is similar to that of the first quarter in 2013 (Figure 2). This low impact may be the result of the displacement of scallop fishing to other areas in the first quarter, perhaps due to the cod area/time closures and voluntary scallop fishery closure areas.

Ranked cod density cells from this analysis had either no scallop catch or very low catch, i.e, less than 5 mt per cell, and, 11 ranked cells were not fished at all by the scallop fleet in 2013 Q1. If scallop fishing in Q1 is confined primarily to 5Zj, as it was in 2013, closure of cells ranked 1 and 2 would have no effect on scallop catches. Ranked cell 15 is part of one of the current industry-initiated scallop-fishery closure areas, and cell 9 is within the "growout" box opened on May 25, 2013. Low scallop catches were seen in 3 cells that were closed in 2013, but the catch levels would have been influenced by the fact that fishing there would have been limited to the period before the closures went into effect.

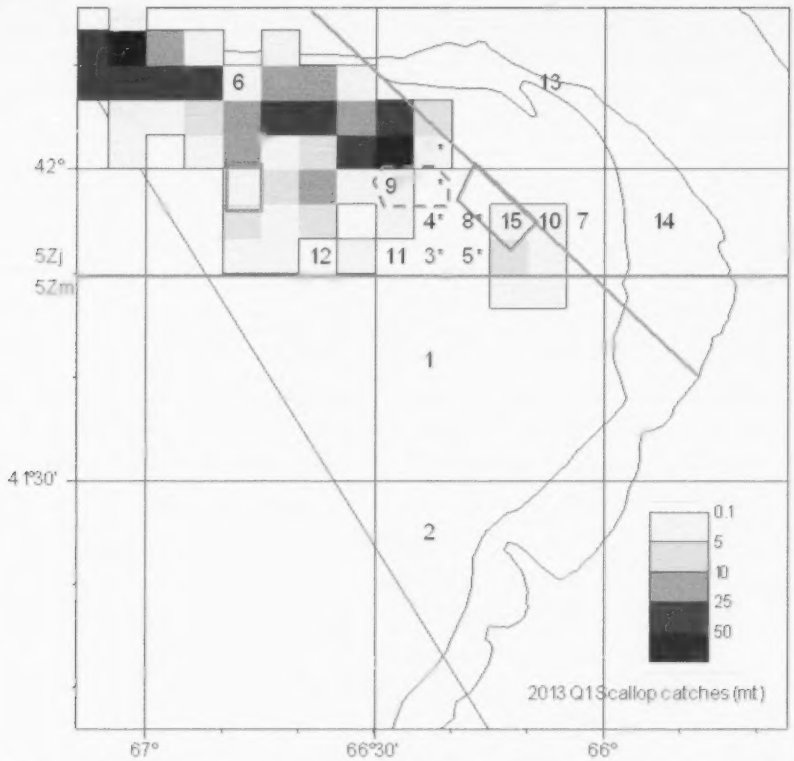

Figure 2. Distribution of Eastern Georges Bank offshore scallop catches (mt of meat) by the Canadian scallop fishery during the first quarter of 2013. Cells that were part of the 2013 scallop fishery cod closure are indicated by an asterisk (*). The 2 current industry-initiated scallop fishery closure areas and the "growout box" (opened May 25, 2013) are outlined in solid and dotted red lines, respectively. The horizontal red line demarcates NAFO divisions 5Zj and 5Zm. The diagonal red line demarcates the Georges Bank scallop management areas 'a' and 'b'. Numbers 1 to 15 represent the ranked cod cells from Figure 1.

Conclusions

To reflect the current cod distribution, a cod area/time closure for 2014 should be based on the average cod distribution from 2004 to 2013. The analysis for the 2013 closure indicated that there has been a change in cod distribution from the first 10 years of the time series (1996 to 2005) to the last 10 years (2003 to 2012) which the 17-year distribution did not capture (DFO, 2013). Continuing with the last 10 years of cod RV survey data would help to ensure that any changes in distribution over time are reflected. There are notable changes in the cells with the highest densities of cod, *i.e.*, the highest ranked cell from last year's analysis is no longer ranked, and the second highest ranked cell from the current distribution was previously unranked.

A closure based on the top ranking cells would have a relatively low impact on the offshore scallop fishery provided the 2014 first quarter scallop fishing distribution is similar to that of the first quarter in 2013.

Contributors

Name	Affiliation
Lou Van Eeckhaute (co-lead)	DFO Maritimes Region - SABS, Science Branch
Alan Reeves (co-lead)	DFO Maritimes Region, Science Branch
Eric Gross (co-lead)	DFO Maritimes Region - SABS, Science Branch
Heath Stone	DFO Maritimes Region - SABS, Science Branch
Brad Hubley (reviewer)	DFO Maritimes Region, Science Branch
Stephen Smith (reviewer)	DFO Maritimes Region, Science Branch
Kirsten Clark	DFO Maritimes Region - SABS, Science Branch
Peter Hurley	DFO Maritimes Region, Science Branch
Verna Docherty	DFO Maritimes Region, Fisheries and Aquaculture Management
Greg Stevens	DFO Maritimes Region, Fisheries and Aquaculture Management
Christie Whelan (chair)	DFO Maritimes Region, Science Branch

Approved by

Alain Vézina
Regional Director of Science, DFO Maritimes Region
Dartmouth, NS
Tel: 902 426-3490

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Sources of Information

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Center for Science Advice (CSA)
Maritimes Region
Fisheries and Oceans Canada
PO Box 1006, Station B203
Dartmouth, Nova Scotia
Canada B2Y 4A2

Telephone: 902 426-7070
Fax: 902 426-5435
E-Mail: XMARMRAP@dfo-mpo.gc.ca
Internet address: www.dfo-mpo.gc.ca/csas-sccs/

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